

Chapter 2

SUPPORT FROM THE DIRECTORATE FOR EDUCATION AND HUMAN RESOURCES (EHR)

Introduction

Within the National Science Foundation, the Directorate for Education and Human Resources (EHR) has primary responsibility for programs that contribute to maintaining the health and continued vitality of the nation's science, mathematics, engineering, and technology (SMET) education and providing leadership in the effort to improve education in these areas. Within EHR, seven divisions—the Division of Undergraduate Education (DUE), the Division of Graduate Education (DGE), the Experimental Program to Stimulate Competitive Research (EPSCoR), the Division of Elementary, Secondary, and Informal Education (ESIE), the Division of Educational System Reform (ESR), the Division of Human Resource Development (HRD), and the Division of Research, Evaluation, and Communication (REC)—are the focal points for these efforts. Many of these divisions directly support efforts in two-year colleges.

Division of Undergraduate Education (DUE)

Faculty members who vigorously combine teaching with scholarship are essential to the creation of vital SMET education. The Foundation seeks to provide incentives and rewards to stimulate and motivate faculty members so that creative teaching and instructional scholarship become a part of the “faculty culture” at all institutions. Faculty members who are primarily teachers need opportunities to deepen their knowledge, as well as opportunities to work in the creative renewal of undergraduate courses, curricula, and laboratories. DUE provided direct support to two-year colleges in FY1997–FY1999 through the programs described below.

Advanced Technological Education (ATE)

The ATE program was created in response to the Scientific and Advanced-Technology Act of 1992 (PL 102-476), which directed NSF to develop models of advanced technological education centered at two-year colleges in order “to expand the pool of skilled technicians in strategic advanced-technology fields, to increase the productivity of the nation's industries, and to improve the competitiveness of the United States.” The program, which made its first grants in 1994, funds projects to prepare students—both traditional students and experienced workers wanting to gain new skills—for rewarding careers as technicians in fields such as biotechnology, chemical technology, environmental technology, information technology, and manufacturing. The program targets both the undergraduate and secondary school levels, and is administered jointly by DUE and the Division of Elementary, Secondary, and Informal Education (ESIE).

Projects supported by the ATE program vary greatly in size and focus. Some concentrate on particular areas of technology; others focus on the fundamental science and mathematics that technicians need in order to succeed in their area of specialization; and others address a broad spectrum of educational needs, from basic to advanced. Projects create and disseminate new educational materials, courses, and degree programs; provide professional development for high school and college faculty; provide internships and other workplace training mechanisms for students and faculty; establish innovative partnerships between educational institutions, business and industry, and government agencies; and allow students to gain hands-on experience with state-of-the-art machinery and instrumentation used in the modern workplace. All ATE projects are expected to be guided by a coherent vision of technological education—a vision that

recognizes the needs of the modern workplace, of students as lifelong learners, and for articulation of educational programs at different levels.

Two-year colleges play a key role in ATE projects, and usually they collaborate with secondary schools, four-year colleges and universities, companies, and government organizations.

ATE Centers of Excellence are the program's flagship projects. They pursue systemic approaches to technician education, usually within a specific field of technology, and are expected to have a broad impact on two-year colleges and secondary schools within a region or across the nation. Currently there are 12 ATE Centers of Excellence spread around the United States. Three focus on information technology, two on engineering technology, two on environmental technology, and one each on biotechnology, distance learning, marine technology, manufacturing, and microelectronics. Other ATE projects, having narrower missions and smaller budgets than the centers, focus on specific aspects of technician education, such as developing or adapting educational materials, providing professional development workshops for college faculty and secondary school teachers, or providing internships and other technical experiences to students.

The following short profiles of particular projects illustrate the range of activities and fields that the ATE program supports. Many other funded projects are described in the program's annual *Awards and Activities* books, electronic versions of which can be found on the Web at <<http://www.ehr.nsf.gov/ehr/duel/programs/ate/>>.

- At Vice President Gore's summit on "21st Century Skills for 21st Century Workers" in January 1999, Bellevue Community College in Bellevue, Washington, was recognized as one of the top 10 community colleges in the nation for updating people's skills for the new millennium, because of the high-quality information technology (IT) curricula offered by the NorthWest Center for Emerging Technologies (Award Nos. 9553727 and 9813446), which is based at the college. This center's main focus has been on developing industry-validated skill standards and associated curricula for IT. It recently received a National Skill Standards Board Recognition Award for its "outstanding achievement and contribution to the development and implementation of skill standards, assessment, and certification in the education and training industry." Microsoft—one of the center's major supporters and an employer of its graduates—also recently produced a video profiling how the center stays on the cutting edge of IT education.
- The Northeast Center for Telecommunications Technologies (Award Nos. 9751990 and 0003014) at Springfield Technical Community College in Massachusetts has assisted the rapid growth of telecommunications programs in community colleges throughout New England. When the center was founded in 1997, no community colleges in the region offered telecommunications programs. By March 2000, 18 community colleges were offering such programs, which enrolled over 3,000 students and utilized educational materials developed at the center. Faculty from 24 colleges have participated in the center's intensive workshops, which give instructors an understanding of the full spectrum of the telecommunications field by integrating the study of wireless, light-wave/photonics, and networking.
- The Maricopa Advanced Technology Education Center (Award Nos. 9602373 and 9908419), a division of the Maricopa Community College District in Arizona, focuses on improving educational programs in semiconductor manufacturing and supporting industries. The center works closely with International SEMATECH (a consortium of 13 semiconductor manufacturing companies from seven countries), the Semiconductor Industry Association (the leading trade association representing the computer chip industry), major companies (including Intel, Motorola, and STMicroelectronics), and over 100 educational partners (high schools, two-year colleges, four-

year colleges, and universities) to develop and field-test educational materials and curricula and to provide internships and other workplace experiences for students and faculty.

- The Marine Advanced Technology Education Center (Award Nos. 9752028 and 0085345) at Monterey Peninsula College in California is developing a modern, national program for marine technology education involving high schools, community colleges, technical schools, and four-year colleges. Recently, staff and students from the center joined a research project (led by Rutgers University scientists) that visited deep-sea hydrothermal vents along the East Pacific Rise and the Galapagos Rift. The expedition was accompanied by IMAX and National Geographic film crews. During the project, the center hosted a Web site with daily cruise updates, scientific data, information about the scientists involved, and an “ask us” feature that allowed students and teachers to ask questions to the scientists out at sea. The center is creating educational modules and activities using the data gathered in the project.
- The project “Advancing Careers in Technology and Science” (Award No. 9950025), based at Collin County Community College in Texas, emphasizes the changing skills and educational requirements in mathematics and science that accompany the transition from the 20th century’s skilled blue-collar technician to the 21st century’s high-tech “gold-collar” technician. The project has collaborated with Southwestern Bell to launch a credit-granting telecommunications program based on industry-developed curricula. This program is intended to provide the skills necessary for Southwestern Bell employees to advance from a non-technical position to a technical position. During the project’s first year, 22 colleges in Texas adopted the program, enrollment grew from 11 to 275, 11 students completed the program and received promotions to technical positions, and the number of faculty members certified to teach the new curriculum grew from 1 to 26.
- In April 2000, the International Technology Education Association’s “Technology for All Americans” project published *Standards for Technological Literacy: Content for the Study of Technology*, a 248-page book which defines what students should know and be able to do in order to be “technologically literate” and which prescribes desired outcomes for the study of technology in grades K–12. Professional societies and educational organizations have strongly endorsed the standards, and the National Academy of Engineering has called them “a key tool for creating lasting, systemic educational improvement.” The project was jointly funded by ESIE’s Instructional Materials Development (IMD) program and the ATE program (Award Nos. 9355826 and 9626809).
- Over 30 of the 40 community college instructors in Virginia who teach drafting and computer-aided design (CAD) courses, and 78 of the approximately 200 Virginia high school teachers who teach such courses, have participated in workshops sponsored by the project “Reinventing Computer-Aided Drafting and Design in a Total Modeling Environment” (Award No. 9752021), which is based at Piedmont Community College. These workshops prepare faculty to teach solid-modeling courses, which are now required for most industry positions in the field. In 1998, 117 community college and high school students participated in pilot courses. In 1999, 300 students participated in pilot courses at six community colleges and six high schools.
- The “Connections Across Cultures” project (Award No. 9602345), managed by the West Valley–Mission Community College District Office in California, has conducted 30 training sessions for more than 780 college faculty members and schoolteachers in 5 states. An online course developed by the project is being offered through Seattle Pacific University and now has students in Colorado, Illinois, Indiana, Oregon, Minnesota, and Washington. The project focuses on helping science and technology teachers learn teaching methods that are well-suited for diverse student populations, so that the teachers can attract and retain more minority and women students in courses and programs that lead to careers as technicians.

- Phi Theta Kappa, the honor society for community colleges, in cooperation with the American Association of Community Colleges, is conducting a project (Award Nos. 9602459 and 9811926) to encourage and assist community colleges in replicating model ATE projects. Leaders of exemplary ATE projects in geographic information systems (GIS), mathematics, biotechnology, environmental technology, precision agriculture, image processing, and engineering technology are mentoring faculty members at over 30 colleges, helping them to adapt educational materials and provide faculty development to meet the particular needs on their campuses. The objective of this project is to improve and strengthen the teaching of science, mathematics, engineering, and technology at the nation's community colleges by disseminating the results of mature NSF-supported projects.
- The American Association of Physics Teachers has undertaken a project, "The Two-Year College in the Twenty-First Century: Breaking Down Barriers," whose aim is to improve learning opportunities for students and support two-year college physics faculty through regional and national activities. The project has developed a network of faculty and significantly enlarged the group of faculty who are regional or national leaders in the two-year college physics community. In addition, through a series of meetings, conferences, and reports, the project has assisted two-year college physics faculty in building a community and in incorporating contemporary developments in physics and physics teaching into their courses. Physics faculty from both transfer and technical programs have been involved.

NSF Collaboratives for Excellence in Teacher Preparation (CETP)

Many future teachers, particularly elementary and middle school teachers, receive all their postsecondary mathematics and science instruction at two-year colleges. In some states, such as Texas and California, over half the teachers begin their academic studies at two-year colleges. The CETP program supports efforts to improve the SMET preparation of future K-12 teachers. Recognizing the important role that two-year colleges play in the education of prospective teachers, the CETP program includes two-year colleges working collaboratively with four-year colleges, universities, and school districts to improve the science and mathematics preparation of teachers colleges. Currently, 102 two-year colleges are involved in CETP projects, representing 30% of the institutions participating in the program. Major areas of focus include the recruitment of prospective teachers, the development of curricula and courses that reflect national standards in science and mathematics and incorporate best practices in pedagogy, faculty enhancement, early field experiences for pre-service teachers, articulation between two-year and four-year institutions, and support for new teachers during their first years of teaching.

- Two-year colleges participating in the Los Angeles Collaborative for Teacher Excellence (LACTE) (Award No. 9453608), which is based at California State University, Dominguez Hills, are tightly involved in designing new articulation agreements with universities and new tracks for pre-service teachers. Teams composed of representatives from two- and four-year institutions have successfully applied for funding from federal and state sources for producing new articulated paths between the two-year and four-year campuses. Glendale College and California State University, Los Angeles, have designed a program that recruits students from Glendale High School, sends them to Glendale College for their first two years, and then moves them to Cal State L.A. for their last two years and their teacher credentialing classes. Every two-year college in the collaborative has activities that provide students with knowledge, experience, and connections with in-service teachers. Student group activities include meeting with current teachers, getting instruction in teaching SMET concepts, exploring the national standards, and going on field trips to educational resources in the Los Angeles area. The student groups also offer two-year transfer students a point of contact in their new four-year institutions.

- The El Paso Partnership for Excellence in Teacher Preparation (PETE) (Award No. 9453612), based at the University of Texas, El Paso (UTEP), involves the university's College of Education and College of Science, El Paso Community College (EPCC), and the three major public school districts in El Paso. EPCC and UTEP are working together to align courses so that students can make seamless transitions from the two-year institutions to the university. The collaborative has recruited and retained promising students in the teaching profession, with particular attention to students from underrepresented groups. Over 90 students at EPCC have been supported as PETE NSF Scholars. Approximately 70% of the students have come from Hispanic backgrounds. At EPCC's Transmountain Campus, PETE NSF Scholars practice-teach by presenting short lessons to invited classes of K-12 students. These lessons are videotaped to document the interaction among the K-12 students, the PETE pre-ed students, and the post-secondary instructors, so that the instructors of the courses and the pre-ed students presenting the concepts can evaluate the lessons.
- The Virginia Collaborative for Excellence in the Preparation of Teachers (VCEPT) (Award No. 9553789), centered at Virginia Commonwealth University (VCU), includes three two-year colleges: J. Sargeant Reynolds Community College (JSRCC), Germanna Community College, and Tidewater Community College. VCEPT faculty and administrators have led statewide efforts to engage two-year colleges in teacher preparation, culminating in the adoption of teacher preparation as a key priority of the Virginia Community College System. Two-year college faculty in the collaborative are team-teaching courses with faculty from partnering four-year institutions. The collaboration between JSRCC and VCU was recognized as a model program by the Virginia General Assembly. A teacher apprentice program also recruits students from two-year college mathematics and science classes to work with mentor teachers in the local school districts.
- The University of Illinois at Chicago (UIC)–Community College Collaborative for Excellence in Teacher Preparation (Award No. 9852167) involves six two-year colleges that are major sources of transfer students for UIC: William Rainey Harper Community College, Oakton Community College, Olive-Harvey College, Triton College, Truman College, and Harold Washington College. The collaborative's activities include faculty development; course and curriculum development in mathematics and science; mentoring and induction support for new teachers; recruitment and retention of teacher candidates, with an emphasis on underrepresented groups; articulation and collaboration between UIC, two-year colleges, and schools; institutionalization; and research and evaluation. The annual Institute for Developing Excellence in Teaching Undergraduate Science and Mathematics includes two week-long faculty development workshops as well as follow-up meetings throughout the year. Participants develop a teaching project to implement curricular or instructional changes in particular mathematics or science courses. Of the 62 participants in the annual institutes, 46 are two-year college faculty.
- Project TEACH (Award No. 9876589), a CETP project centered at Green River Community College (GRCC) in Washington, is a collaboration with Central Washington University and six local school districts, including the Muckelshoot Tribal Schools. The project has developed a new pre-professional Associate of Arts degree in elementary education at GRCC that provides a foundation for the university's teacher certification program. The two-year degree includes a mathematics course sequence designed for elementary teachers, an interdisciplinary and thematically based science course sequence, and introductory teacher education courses with field-based activities. Students in Project TEACH courses are paired with elementary school teachers to observe and help design exemplary mathematics and science lessons. Students also tutor in K-12 schools and participate in a summer mathematics camp for elementary students located on the GRCC campus. A certificate for paraprofessionals includes options for early childhood education and elementary education and articulates with the pre-professional degree.

Course, Curriculum, and Laboratory Improvement (CCLI)

The CCLI program was launched in FY1999 by combining major features from the Course and Curriculum Development (CCD), Instrumentation and Laboratory Improvement (ILI), and Undergraduate Faculty Enhancement (UFE) programs. The goal of the new program is to revitalize and improve the quality of SMET education obtained by all undergraduate students at all types of institutions. The CCLI program supports projects at all levels of undergraduate education, with emphasis on introductory-level courses, curricula, and laboratories. The program has three tracks to accomplish these goals:

- The Educational Materials Development (EMD) track supports the development of educational materials that incorporate educational practices that are effective in improving learning of SMET by undergraduates with diverse backgrounds and career aspirations (i.e., all students).
- The Adaptation and Implementation (A&I) track promotes the improvement of undergraduate SMET education through the adaptation and implementation of materials, techniques, and practices developed elsewhere, which have been shown to be effective, in order to accomplish positive change at an institution.
- The National Dissemination (ND) track supports the national dissemination of exemplary materials and practices through the provision of faculty professional development opportunities.

Examples of CCLI projects involving two-year colleges include the following:

- The Community College of Southern Nevada is leading four other community colleges in the Southwest—Fullerton College in California, Albuquerque Technical Vocational Institute in New Mexico, the City College of San Francisco, and Montgomery College in Texas—in a project to transfer reforms in undergraduate chemistry education to two-year colleges (Award No. 9950320). This consortium impacts almost 5,000 first-year chemistry students per year. The project is adapting and adopting the methodology and materials developed by the “Molecular Science” project and others funded through the “Systemic Changes in the Undergraduate Chemistry Curriculum” initiative within NSF’s Course and Curriculum Development (CCD) program.
- To improve students’ success in developmental mathematics courses, a project at Bunker Hill Community College in Massachusetts (Award No. 9950568) is developing and testing a collection of mathematics software for use in the classroom or by individual students and is linking the developmental mathematics course to a one-credit course, “Strategies for Student Success,” which covers study strategies specifically related to the learning of mathematics. In addition to the software tools, this project is producing a companion resource guide for instructors and a series of “Success in Mathematics” modules.
- The National Chautauqua Workshop Program (Award No. 9950627), coordinated by the University of Pittsburgh, offers an annual series of workshops in which scholars at the frontiers of science, mathematics, and engineering work intensively for several days with undergraduate faculty to bring them up-to-date with the state of the art. It is anticipated that the workshops offered across the United States between 2000 and 2004 will provide enrichment experiences to 15,000 college instructors, 5,000 of whom will be drawn from two-year colleges.
- Blue Ridge Community College in Virginia is revising the content and curricular framework of its Mechanical Engineering Technology (MET) cluster to create an innovative, comprehensive educational program that will provide highly skilled technicians for manufacturing industries (Award No 9950726). Projects in the college’s new Mechanical Engineering Technology Center and courses in the MET cluster are adapting computer numeric control conversational programming applications and 3-D modeling modules previously developed by Virginia Highlands

Community College and Piedmont Virginia Community College to enhance the cluster's holistic approach to learning.

- Seven instructional modules to improve students' estimation, reasoning, and problem solving skills in intermediate algebra are being designed at San Diego State University (Award No. 9950746), and the curriculum is being evaluated in the Minority Science Improvement Program at Southwestern Community College, where the student population is composed of 78% ethnic minorities. Southwestern's program aims to improve the transfer rates of minority students who have an interest in mathematics, science, or engineering.
- Two two-year colleges—SUNY Farmingdale and Adirondack Community College—are participating with five other colleges, representing a subset of the New York State Coalition of 30 two- and four-year colleges, in a project to reform science, mathematics, and technology curricula on the campuses by adapting educational materials and practices developed by other NSF and privately funded projects (Award No. 9950803). In particular, the colleges are adapting and implementing materials developed by projects funded through the “Mathematics Across the Curriculum” initiative within NSF's Course and Curriculum Development (CCD) program. Faculty and administrators at the colleges are committed to making institution-wide changes and are centering their efforts around five themes: mathematical modeling, inquiry-based learning, partnerships, technology, and programmatic change.
- The Delaware Technical and Community College Stanton-Newark Campus is implementing a new A.A.S. degree program in chemical process operator technology (Award No. 9950887), which is based on the American Chemical Society's Voluntary Standards for Chemical Process Industries Technical Workers. The project is also helping to equip four state-of-the-art laboratories for integrated use in the Chemical Process Operator Technology, Mechanical Engineering Technology, Industrial Plant Maintenance Technology, and Process Instrumentation Technology programs. By working with an advisory committee representing local chemical industries, faculty are ensuring that the new curriculum and laboratories meet standards of industry, the American Chemical Society, and the Technology Accreditation Commission of the Accreditation Board for Engineering and Technology.

Course and Curriculum Development (CCD)

The CCD program, which made its last awards in FY1998 and was subsequently subsumed into the new Course, Curriculum, and Laboratory Improvement (CCLI) program, supported projects to improve the quality of courses and curricula in SMET. It encompassed activities affecting the learning environment, content, and experience of instruction.

Within the CCD program, the initiative “Systemic Changes in the Undergraduate Chemistry Curriculum” was launched to enhance the learning and appreciation of science through significant changes in chemistry instruction. Two-year colleges were part of the consortia of institutions involved in the five major projects funded through this initiative. The materials and educational practices developed by these projects were initially tested at the consortium institutions and then disseminated to other institutions via special symposia and workshops, and through direct grants from NSF to other institutions, including a large number of two-year colleges, interested in adapting and implementing these materials and practices.

The CCD initiative “Institution-Wide Reform of Undergraduate Education in Science, Mathematics, Engineering, and Technology” supported projects to stimulate reform of SMET education for all students and to provide national models of excellence. The initiative aimed for visionary, comprehensive plans based on successful and significant accomplishments to catalyze modifications in the institutional culture and infrastructure that are prerequisite to systemic reform. Awards were intended to motivate changes in

priorities and the allocation of resources so that institutions could produce self-supporting reform initiatives.

Examples of CCD projects involving two-year colleges include the following:

- Sinclair Community College in Ohio has created a “parallel college” to pilot-test institution-wide reform efforts in science, mathematics, and engineering technology education (Award No. 9653670). This effort is testing methods of correcting common problems that face two-year colleges across the country: misalignment of curricular formats with modern delivery systems, misalignment of curricular outcomes with modern workplace requirements, and misalignment of college operating systems with modern operating systems. The test is revealing the changes required in day-to-day operating systems to achieve the goals of higher quality and greater responsiveness to the needs of students and employers.
- The project “Beyond Formulas” at Brevard Community College in Florida (Award No. 9752241) is developing interdisciplinary, workplace-oriented modules involving five areas of mathematics: algebra, statistics, trigonometry, precalculus, and calculus. Each module exposes students to real-world problems through case studies, provides overviews of the industries to which the case studies relate, and integrates mathematical theory within the industrial context. By relating abstract concepts to meaningful problems from the workplace, the project is improving students’ appreciation of mathematics and increasing their critical thinking and intuitive abilities—beyond the rote memorization of formulas—so that they will be able to effectively solve problems and make decisions as employees in a highly technological workplace. The modules are being pilot-tested and evaluated by faculty from other two-year colleges and an external evaluator from Manatee Community College.
- A team of 13 mathematicians, scientists, and science educators at three institutions—the University of Delaware, Delaware State University, and Delaware Technical and Community College—have joined together in a project (Award No. 9752285) to reform teacher preparation courses on their campuses, making the courses student-centered, inquiry-based, and aligned with the national K-12 science standards. The faculty members are coordinating the three institutions’ courses for pre-service teachers and are integrating mathematics and science content with pedagogy in the courses.
- A project at Turtle Mountain Community College (Award No. 9752568) aims to increase the number of students majoring in science and to produce attractive, effective modular materials in interdisciplinary science for use at Turtle Mountain and other tribal colleges. The project has designed modules on fish species composition, fish life histories, and the effects of water quality on fish. In each module, students perform field exercises (in local lakes) and laboratory exercises in cooperative groups. The final product is a CD-ROM-based interactive program for beginning biology, chemistry, ecology, and wildlife courses.
- Led by Oakton Community College, chemistry faculty from nine Illinois two-year colleges have formed a consortium to reform the first-year chemistry curriculum on member campuses (Award No. 9752885) by adapting and adopting materials produced by the Modular Chemistry Consortium and the ChemLinks Coalition, two of the flagship projects funded through the CCD program’s “Systemic Changes in the Undergraduate Chemistry Curriculum” initiative. The new chemistry curriculum is active and inquiry-based and is flexible enough to address the many learning styles represented by a diverse student population. The two-year colleges in the consortium have a combined annual chemistry enrollment of over 6,000 students.
- Prince George’s Community College in Maryland is undertaking an institution-wide reform of courses and curricula with the goal of increasing students’ technological skills and their under-

standing of the interdisciplinary nature of the natural sciences, mathematics, social sciences, and technology (Award No. 9850052). Faculty members from a range of disciplines are developing and testing a set of educational modules that utilize technology, have an interdisciplinary character, and are capable of spawning other curriculum products across the college.

Instrumentation and Laboratory Improvement (ILI)

The ILI program also made its last awards in FY1998 and was subsequently subsumed into the new CCLI program. The ILI program supported the development of new or improved laboratory courses or experiments in SMET. The program largely provided matching grants for equipment to carry out a proposed project, which could then serve as a model for the use of instrumentation at other institutions.

Examples of ILI projects involving two-year colleges include the following:

- Guilford Technical Community College in North Carolina is equipping a modern, accessible astronomical observatory that will serve students at the college, as well as students at nearby colleges, high schools, and elementary schools and the general public (Award No. 9750802). The centerpiece of the program is an observatory with a 16-inch telescope, equipped with a CCD camera, spectroscope, photometer, and auxiliary equipment.
- Trident Technical College in South Carolina is developing a new laboratory to incorporate state-of-the-art dimensional measuring into the technology programs at the college (Award No. 9751185). Students are learning to use both mechanical and digital dimensional measuring instruments, gaining exposure to advanced instrumentation used by industry leaders, coming to understand better the metric system and its purpose in the manufacturing and engineering community, and learning the theory and application of data collection equipment in statistical process control in manufacturing.
- The Laser Electro-Optics Technology Department at Springfield Technical Community College in Massachusetts is enhancing its curriculum by developing a lightwave communications laboratory (Award No. 9751333). Each of the laboratory's workstations can emulate a real-world fiber optic communications system, capable of transmitting analog and digital information at rates of up to 2.5 GHz through several kilometers of both single-mode and multi-mode fiber. Hands-on experience with a working lightwave communications system makes students better-prepared to pursue careers in the rapidly growing field of photonics or telecommunications.
- To enhance physics instruction, the "Amusement Park Physics" project at Porterville College in California (Award No. 9850683) is collecting high-resolution inertial data from a variety of popular amusement park rides and designing multimedia software to process and display the data. The displays include an animated re-creation of the ride, with vector diagrams attached to the moving cart, bar graphs showing scalar quantities such as potential and kinetic energy, and a synchronized video display. This educational tool is being tested and evaluated in the physics, physical science, and calculus classes at Porterville College and in classes at two local high schools.
- With new state-of-the-art equipment, Lakeland Community College in Ohio is preparing and retraining bioscience technicians; conducting biotechnology workshops for college faculty, high school faculty, and high school students; making systemic changes in college and high school science curricula; and developing a biotechnology Tech Prep program (Award No. 9851385). The college's Bioscience Technology Program is being developed jointly by scientists in the biotechnology industry and researcher-educators in academic institutions.

Undergraduate Faculty Enhancement (UFE)

The UFE program also made its last awards in FY1998 and was subsequently subsumed into the new CCLI program (especially the CCLI program's "National Dissemination" track). The UFE program supported projects enabling faculty members who teach undergraduate courses to gain experience with recent advances and new experimental techniques in their fields and to learn new ways to incorporate these into undergraduate instruction. Projects were regional or national in scope and typically consisted of hands-on workshops or short courses, along with follow-up activities. UFE workshops were often held on two-year campuses, as well as on four-year college and university campuses, to encourage collaboration of faculty from many types of institutions. Regional coalitions of two- and four-year colleges and universities were a major feature of many UFE projects. Two-year college faculty attended many of the workshops supported by the UFE program.

Examples of UFE projects involving two-year colleges include the following:

- For seven years, Joliet Junior College in Illinois and Lee College in Texas have organized a series of intensive workshops for physics faculty at geographically-dispersed two-year college campuses (Award No. 9554683). So far, 34 week-long workshops have involved 778 faculty from 281 two-year colleges in 46 states and U.S. territories. Topics have included microcomputer-based laboratories in mechanics and heat; digital video, modeling, and microcomputer-based laboratories in electricity, magnetism, and optics; physics simulations; active learning problem-solving strategies using conceptual exercises and case studies; recent developments and findings of physics education research; and new developments and technologies for introductory physics courses. These workshops have assisted two-year college faculty in keeping up with recent developments in physics and physics teaching, and they have also helped connect two-year college faculty with the physics research community. After the workshops, participants have continued their interactions through an electronic bulletin board and a newsletter.
- During the summer of 1997, Prince George's Community College (PGCC) in Maryland conducted a four-day workshop for 24 psychology faculty from two-year and small four-year colleges in the mid-Atlantic states (Award No. 9653441). Workshop topics, which were developed from a survey distributed to two-year college faculty in four states, included biopsychology, research methodology and statistics, implementation of technology in psychology courses and its effect on student performance, and the integration of multiculturalism into the curriculum. Follow-up activities included the development of teaching modules based on workshop topics and a one-day return workshop at PGCC during the spring of 1998.
- The Two-Year College Physics Faculty Enhancement Program, coordinated by the Texas Engineering Experiment Station, was designed to serve as model for utilizing cooperative relationships between university professors and outstanding two-year college faculty members, who worked together to provide professional enrichment opportunities for two-year college physics faculty from across the United States (Award No. 9752718). The two-year program sponsored national workshops focusing on recent developments in physics research, innovative methods for teaching physics, and successful techniques for recruiting minority students into science and engineering programs at two-year colleges.
- In 1998 and 1999, DIMACS—the Center for Discrete Mathematics and Theoretical Computer Science, based at Rutgers University in New Jersey—conducted workshops to “reconnect” to mathematical sciences research many two- and four-year college faculty who do not have time to keep up with research developments (Award No. 9752776). Two-week summer workshops presented recent research results in topics such as computational molecular biology, network visualization, clustering, and visibility in geometry. A sequence of two-day workshops, directed mainly at two-year college faculty, presented an introduction to discrete mathematics and theoretical

computer science. Both the two-day and the two-week workshops engaged the participants in writing and publishing curriculum materials and exposed them to research being conducted at DIMACS, an NSF Science and Technology Center involving Rutgers, Princeton University, AT&T Labs, Bell Labs, Telecordia Technologies, and the NEC Research Institute.

- Working with the Community Colleges for Innovative Technology Transfer, Foothill College in California sponsored eight regional workshops during the summers of 1998 and 1999, providing faculty with training in remote sensing, image processing, geographic information systems, and geographic positioning systems (Award No. 9752778). Approximately 180 faculty members from two-year colleges and senior institutions participated in the workshops, which enabled them to develop additional curriculum modules integrating the four technologies into their individual instructional areas.

Division of Elementary, Secondary, and Informal Education (ESIE)

ESIE supports programs designed to improve the educational experiences of all students in school settings and to increase and improve the opportunities for all individuals to explore science, mathematics, and technology beyond the school setting. The division achieves these goals by supporting projects to develop and implement high-quality instructional materials and assessments; to enhance the mathematical, scientific, pedagogical, and technological knowledge of teachers and create a cadre of teacher change-agents; and to provide stimulating environments outside of school to increase the understanding and appreciation of science and mathematics and their applications by individuals of all ages.

Advanced Technological Education (ATE)

ESIE co-manages the ATE program. During the years 1997–1999, approximately 25% of the program's budget was in ESIE, and 75% in DUE. Funding decisions, however, were always jointly made. An overview of the ATE program was given earlier in this chapter.

Local Systemic Change (LSC)

The Local Systemic Change Through Teacher Enhancement in Science Grades 6–12 (LSCS) initiative encourages schools, school systems, or collaborations of schools, with their partners, to initiate systemic efforts that will result in teachers making significant progress towards reaching national goals for the teaching of science. Projects that align policy and practice include (1) a shared comprehensive vision of science, which includes goals and objectives for student learning and incorporates national and state standards for curriculum, teaching practice, and assessment; (2) active partnerships and commitments among stakeholders; (3) a detailed self-study that provides a realistic assessment of the current system's strengths and needs; (4) strategic planning that incorporates mechanisms for engaging each teacher in intensive professional development activities; (5) leadership and technical support for the participating school districts to design, develop, and enact a framework for science curriculum and instruction; (6) appropriate integration of educational technologies; and (7) an evaluation plan that provides on-going feedback for the project. For example, Radford University, in cooperation with local schools, is implementing a project in which all K-8 teachers in 39 schools are changing their elementary science curricula (Award No. 9819562). Southwest Virginia Community College is providing the facility to host the workshop and is involved in other substantive ways.

The Local Systemic Change Through Teacher Enhancement in Mathematics Grades 7–12 (LSCM) initiative is designed to initiate systemic efforts that will result in teachers making significant progress towards reaching national goals for the teaching of mathematics. For example, the Maricopa Community College

District is implementing the Interactive Mathematics Program (IMP) through the use of seven integrated components: in-service enhancement on the mathematics and pedagogy of IMP, follow-up support activities, internal capacity for professional development, school teams for support of teachers, teachers from schools considering IMP, articulation with feeder schools, and impact on pre-service teacher training. This five-year project (Award No. 9634034), led by Maricopa, involves mathematics teachers in grades 9–12, Arizona State University, and the Intel Corporation.

Young Scholars (YS)

The YS program targeted high-potential and high-ability students in grades 7-12 and was designed to inform and excite these students about SMET disciplines and to encourage them to investigate careers in these fields. The program emphasized student participation in the process of scientific discovery through interaction with practicing scientists and science educators both in the laboratory and in the field. Projects offered a combination of instruction, research, and problem-solving activities, along with a discussion of career preparation and scientific ethics. For example, Atlanta Metropolitan College's YS project in chemistry and mathematics for students in grades 7 and 8 (Award No. 9553538) included classroom discussions, laboratories, and field experiences stemming from the investigation of the chemistry of the environment. Prince George's Community College's YS project in field biology (Award No. 9553500) involved students in researching endangered cranes, osprey banding, aquatic ecology, and turfgrass.

Division of Human Resource Development (HRD)

The programs in HRD reflect NSF's commitment to developing the resources of the scientific and technical community as a whole. The division has primary responsibility for broadening participation of individuals from groups underrepresented in SMET, and the division operates and coordinates a range of programs that focus on increasing the presence of minorities, women and girls, and persons with disabilities in SMET.

Louis Stokes Alliances for Minority Participation (LSAMP)

The LSAMP program is designed to develop the comprehensive strategies necessary to strengthen the preparation and increase the number of minority students who successfully complete baccalaureates in SMET fields. Institutions participating in the program are committed to better serve all SMET students today and to institutionalize changes that will ensure that all students have access to quality SMET educational opportunities.

LSAMP projects are administered through cooperative agreements in partnership with NSF. These agreements contain each alliance's goal (the current number of minorities obtaining BS degrees in SMET and the alliance's five-year goal) and specific work statements that describe how the alliance will achieve its goal.

As necessary to achieve LSAMP objectives, alliances establish partnerships among two-year colleges, four-year colleges and universities, school systems, other government agencies, major national SMET laboratories and centers, industry, private foundations, and SMET professional organizations.

As indicated in the following table (Table 1), two-year colleges are involved in virtually every LSAMP project.

Table 1
**TWO-YEAR COLLEGES IN THE
 LOUIS STOKES ALLIANCES FOR MINORITY PARTICIPATION**

Alliance	Award No.	Total Colleges	Two-Year Colleges	
Colorado	9623946	13	CC of Denver Front Range CC	Pueblo CC
Florida-Georgia	9703197	12	Florida CC at Jacksonville Miami-Dade CC	Tallahassee CC
Heartland	9550704	10	Metropolitan CC	St. Louis CC
Louisiana	9550765	13	Nunez CC	
Mid-South	9553315	11	Mid-South CC	Shelby State CC
Montana	9450369	20	Bay Mills CC Blackfeet CC Cheyenne River CC Fond Du Lac Tribal & CC Fort Berthold CC	Fort Peck CC Haskell Indian Nations U. Lac Courte Oreilles Ojibwa CC Little Hoop CC Little Priest Tribal College
New Mexico	9802223	27	Albuquerque Tech. Voc. Inst. Clovis CC Diné College Eastern NM U., Roswell Luna Voc. Tech. Inst. Mesa Tech. College NM Junior College NM Military Inst. NM State U., Alamogordo NM State U., Carlsbad	NM State U., Dona Ana NM State U., Grants Northern NM CC San Juan College Santa Fe CC Southwestern Indian Polytechnic Inst. U. of NM, Gallup U. of NM, Los Alamos U. of NM, Taos U. of NM, Valencia
New York City	9703600	16	Borough of Manhattan CC Bronx CC Hostos CC Kingsborough CC	La Guardia CC New York City Tech. College Queensborough CC
State University of New York	9623931	16	Broome CC Dutchess CC Nassau CC Orange County CC Schenectady County CC	Suffolk County CC SUNY at Farmingdale Tompkins-Cortland CC Ulster County CC
Texas A&M University System	9624602	14	Blinn College Coastal Bend College Del Mar College El Centro College Houston CC	Laredo CC Palo Alto College Richland College San Antonio College
University of Texas System	9701775	19	Alamo CC Austin CC Collin County CC Dallas County CC El Paso CC	Howard College Midland College Odessa College South Texas CC Tarrant County Junior College

(continued)

Alliance	Award No.	Total Colleges	Two-Year Colleges	
Western	9623615	41	Chandler-Gilbert CC Cochise College Diné College El Paso CC Estrella Mountain CC Gateway CC Glendale CC Mesa CC Northern NM CC Paradise Valley CC	Phoenix College Pikes Peak CC Pima CC Pueblo CC Rio Salado College Salt Lake CC Santa Fe CC Scottsdale CC South Mountain CC Southern Nevada CC

Other HRD Programs

The Model Institutions for Excellence initiative continued to offer an opportunity for Oyate tribal colleges and their 26 tribal counterparts to reach underrepresented American Indian students and to bring academic and technical expertise to tribal nations in ways that may make the difference between extinction and tribal self-sufficiency (Award No. 9550533). In this program, Cheyenne River, Standing Rock, and Sisseton Wahpeton community colleges are joining with Oglala Lakota College and Sinte Gleska University to develop programs in environmental science and software engineering.

The Model Projects for Women and Girls initiative seeks to encourage the design and implementation of innovative, short-term, and highly focused activities, strategies, and materials to improve educational achievement and to encourage entry and improvement of women and girls into SMET fields. For example:

- Borough of Manhattan Community College is building and expanding on a successful calculus reform project to recruit and retain women (Award No. 9710273). The program emphasizes collaborative work on complex, real world problems, using appropriate technology, creating portfolios, and involving students in research projects.
- Muskingum Area Technical College's program for encouraging women and girls in science (Award No. 9714792) involves an international wildlife research and conservation center in an intensive science, mathematics, and engineering (SME) intervention program for females in grades 6–12. Key offerings are monthly seminars and informal discussions with women in SME professions, field trips involving hands-on activities, academic instruction, and a mentoring program.
- A grant to the Old Dominion Research Foundation (Award No. 9714637) involves a co-PI from Southwest Virginia Community College in the implementation of a statewide institute for gender-balanced education to serve K-12 counselors. The primary goals of the project include raising awareness about gender issues as they relate to the interest and success of girls in elementary through secondary schools and assisting counselors in fostering a gender-fair learning environment in their work with teachers, administrators, parents, and students.
- The Harbor Branch Oceanographic Institution is working with Indian River Community College and the local school district to provide transition-point young women (middle to high school, high school to college, and women re-entering college) with experiences and materials geared to support them in the pursuit of science-oriented career paths (Award No. 9710971).

The Program for Persons with Disabilities promotes the development and dissemination of innovative intervention strategies that reduce the barriers that inhibit the interest, retention, and advancement of students with disabilities in science, mathematics, and engineering (SME) education and career tracks. For example, an alliance of 20 community colleges and universities, led by New Mexico State University (NMSU), has initiated multiple projects to alleviate the lack of representation in SME by students with disabilities (Award No. 9800298). Typical outreach projects include “Netsurf” at NMSU, which excites middle and high school students with Web page computer experiences; the Children’s College at the University of New Mexico, Los Alamos, which touches 5th and 6th graders with hands-on science experiences; and a project at Diné College that brings two weeks of science fun to middle school Navajo students. Teacher workshops reinforce inclusion and promote bridging of high school students into college through cooperation between special and general education teachers.

The Presidential Awards for Excellence in Science, Mathematics, and Engineering Mentoring program, administered by NSF on behalf of the White House, seeks to identify outstanding mentoring efforts or programs designed to enhance the participation of groups underrepresented in science, mathematics, and engineering. The awardees serve as exemplars to their colleagues and are leaders in the national effort to more fully develop the nation’s human resources in science, mathematics, and engineering. For example, the Scientific Knowledge for Indian Learning and Leadership (SKILL) program at Oglala Lakota College in South Dakota addresses academic support and career guidance for a large number of Native American students at the elementary, middle, and high school levels. The program indicates an excellent record of influencing transition into postsecondary institutions. The high school graduation rate among participants is 100 percent. Complementing this record is an ACT performance average that exceeds the national average. SKILL has reached a relatively large number of American Indian students (3,000), fostering their interest in science and mathematics. The program shows good success in student retention and transition to college from high school. The strengths of the awardee include continuity of focus on Native Americans, early and sustained intervention, demonstrated staff dedication and leadership, and a holistic approach to supplemental learning.

Division of Research, Evaluation, and Communication (REC)

Networking Infrastructure for Education (NIE)

The NIE program was designed to build synergy among technology and education researchers. It was a joint effort between the Computer and Information Science and Engineering (CISE) and Education and Human Resources (EHR) directorates. The aims of the program were to expedite the development of a widespread high-performance electronic communications infrastructure in support of SMET education reform and to lay a foundation on which strategies for the appropriate use of technology in support of increased student achievement could be developed. NIE awards built synergy between technology and education researchers, developers, and implementers to explore networking costs and benefits; tested self-sustaining strategies; and developed models of a flexible educational networking infrastructure to speed the pace of educational innovation and reform.

The NIE program supported projects in the areas of (1) programmatic evaluation of the impact of existing technology programs on the infrastructure of education and on systemic reform; (2) widespread dissemination to appropriate audiences of the outcomes of existing models, both successful and unsuccessful; and (3) electronic library implementation prototypes. Many projects funded by the program included collaborations of groups interested in mathematics and science education. Two-year colleges were often represented on such teams and participated through advisory committees and dissemination and outreach activities. For example, the New Jersey NIE project worked with community colleges in collaboration with the New Jersey Statewide Systemic Initiative; and the University of Hawaii trained faculty from

community colleges and provided mechanisms through which community colleges worked with K-12 faculty to articulate common educational goals and concerns.

In several projects, two-year colleges were the lead institutions. For example, the NIE program continued to provide support for Diné College to implement the Navajo Learning Network (NLN), a four-part project with the overall objective of establishing a single virtual campus linking all educational institutions within the Navajo Nation (Award No. 9554344). Teaching, research, and curriculum development activities are being carried out collaboratively by K-12 as well as Diné faculty and students. A base level of connectivity between participating institutions is being accomplished by utilizing the wide area network developed by the Navajo Nation government that connects participating Navajo Nation K-12 schools to Diné College's system and out to the Internet. The NLN project team, together with trainers from Los Alamos National Laboratory, provide training on both NLN and Internet access and are working closely with Diné and K-12 faculty to develop effective strategies for utilizing information technology as a teaching and learning tool in a way that is sensitive to the learning styles prevalent among Navajo schoolchildren.

A project based at the Monterey Peninsula Unified School District (Award No. 9554325) involves a co-PI from Cabrillo College. The consortium is a broad-based collaboration of scientific research organizations, education and government agencies, libraries, museums, and business/industry partners working to develop a collaborative educational networking infrastructure, "Monterey BayNet," that would build a sustainable base and serve as a national model for the application of telecommunications technology to science education. Teams of scientists, educators, and students design initial electronic field trips around four exemplars: the Virtual Canyon Project with the Monterey Bay Aquarium and the Monterey Bay Aquarium Research Institute; the Watershed Project with the Monterey Bay National Marine Sanctuary and Moss Landing Marine Laboratories; the Virtual Telescope Project with the Monterey Institute for Research in Astronomy; and Building Bridges on the Super Highway with Cabrillo College.

Studies and Indicators (SI)

The SI program sponsored research on significant factors, trends, and practices that assist NSF and other agencies and organizations to strengthen SMET education. Priorities focused on five broad policy areas: (1) participation in science, (2) teacher supply and qualifications, (3) instructional and school practices, (4) educational reform, and (5) the role of science and mathematics skills in the workforce. For example, Indian River Community College in Florida is identifying sets of core competencies and skills in SMET that are required by industries that hire two-year college graduates with technical degrees (Award No. 9628036). The project has investigated five technology-based industries, interviewed technicians and their supervisors, and produced research papers on the integration of community college curricula with industrial needs.

Applications of Advanced Technologies (AAT)

The AAT program provided support for a project led by Arizona State University that involves the integration of nanoscience and nanotechnology concepts into upper-division high school and lower-division college curricula (Award No. 9632740). This "Interactive Nano-Visualization in Science and Engineering Education" project uses innovative educational approaches that help students understand the structures and properties of matter on a scale below 100 nanometers—i.e., the nanoscale. The project is creating a consortium of university and industry scientists, two-year college and high school science faculty, and museum educators with a common vision of creating an interactive Web site to develop a new educational thrust based on remote operation of advanced microscopes and nanofabrication tools coupled to powerful surface characterization methods. The centerpiece of this project is the revolutionary scanning probe

microscope, which has evolved rapidly into a relatively simple, yet powerful, technique capable of imaging and manipulating materials at resolutions down to the atomic scale. This allows students and teachers nationwide to operate and learn about nanotechnology using this Nobel prize-winning technique.

Division of Educational System Reform (ESR)

ESR supports the statewide, urban, and rural systemic initiatives. Two-year colleges are involved, as appropriate, in numerous state and urban systemic initiatives. The focus of these programs is to improve science, mathematics, and technology education for grades pre-K through 12. The Rural Systemic Initiatives (RSIs) involve two-year colleges in substantive ways. ESR's urban efforts, such as the Comprehensive Partnerships for Mathematics and Science Achievement (CPMSA) program, also encourage the involvement of two-year colleges and four-year colleges.

Rural Systemic Initiatives (RSI)

The goal of the RSI program is to promote systemic improvements in science, mathematics, and technology education for students in rural, economically disadvantaged regions of the nation and to ensure sustainability of these improvements by encouraging community development in conjunction with instructional and policy reform. In addition, programs should help prepare a technologically competent workforce to enhance the infrastructure of economic development activities within a community or region by strengthening the SMET instructional capacities of regional colleges and universities, particularly community and technical colleges responsible for technician education. Programs also strengthen other lower-division instruction of technical curricula and entry-level science and mathematics curricula of the future teaching workforce. These collaborations extend across K-12 school systems and into institutions of higher education. Each of the RSI projects includes participation of two-year colleges and other institutions that award associate degrees.

The RSIs that include two-year college representation are geographically and intellectually related networks established to address local challenges, goals, and commitments. These projects are located at regional institutions of higher education and serve as conduits of information and expertise between the students and the outside world. For example, the High Plains Rural Systemic Initiative (HPRSI) (Award No. 9554467), led by Turtle Mountain Community College, continues to bring together 17 tribal colleges and other entities involved in SMET education in Montana, Nebraska, North Dakota, South Dakota, and Wyoming. HPRSI directs capacity-building at the other colleges and has implementation activities at all 17 sites. This initiative is seeking to identify and coordinate efforts to remove impediments for exemplary student performance in SMET education among American Indians.

Comprehensive Partnerships for Mathematics and Science Achievement (CPMSA)

The CPMSA program, one of ESR's urban efforts, encourages the involvement of two- and four-year colleges in urban areas to improve achievement in the K-12 schools. For example:

- In the Kansas City, Kansas, CPMSA (Award No. 9701863), Kansas City Kansas Community College (KCKCC) works with the Kansas City Public Schools. The project blends the efforts of an urban school district and an array of partners in a long-range project to significantly increase minority enrollments and success rates in courses making up the SMET pipeline. A policy change has allowed for the implementation of a unique hook-up between high school computer labs and the KCKCC mathematics lab. This allows students to receive dual enrollment in college algebra while physically accessing the college math lab at the high school site. Potentially, high school

students can take courses ranging from pre-algebra to calculus by accessing the college's math lab via the Internet. An additional resource available to students and teachers has been the Saturday Academy, which was developed in cooperation with the school district, the University of Kansas Medical School, and KCKCC. Children participated in the Science Academy held on the KCKCC campus on designated Saturdays throughout the 1999–2000 school year. This event provided a time of enrichment in science and mathematics, and each student used KCKCC facilities to conduct research in an area of interest, culminating in a presentation to peers, parents, and the community.

- The Richmond, Virginia, CPMSA has established a dual-degree program with J. Sargeant Reynolds Community College (JSRCC). In this program, Richmond schoolteachers who have a master's degree in a content area become adjunct faculty at JSRCC. Students who enroll in the courses are taught at the high school where the teacher normally works. Students can take courses in English composition, English literature, computer programming (Visual BASIC and COBOL), auto mechanical design, calculus, algebra, marketing, and several other technology-based areas. Students who successfully complete the courses are awarded college credit. For working as adjuncts in the college, the teachers are provided a stipend from JSRCC that is awarded to the Richmond Public School District. The district then pays back to the college the cost of the tuition for the high school students who are enrolled in the dual-degree program.
- The Prince George's, Maryland, CPMSA has fostered an excellent relationship between the Prince George's Public Schools and Prince George's Community College (PGCC). At PGCC, a dozen teachers and over 30 students have participated in a Saturday program in computer technology. In addition, the partnership has made the college well-poised to advance the local production of K-12 teachers. PGCC has an interest in being a seedbed for the development of new teachers, and it awards an A.S. degree in teacher education.

The Experimental Program to Stimulate Competitive Research (EPSCoR)

EPSCoR is based on the premise that universities and their science and engineering faculty and students are valuable resources that can potentially influence a state's development in the 21st century much in the same way that agricultural, industrial, and natural resources did in the 20th century. EPSCoR's goal, therefore, is to identify, develop, and utilize a state's academic science and technology resources in a way that will support wealth creation and a more productive and fulfilling way of life for a state's citizenry. NSF's EPSCoR Office actively cooperates with state leaders in government, higher education, and business to establish productive long-term partnerships. In each EPSCoR state, NSF's role is catalytic in nature and is designed to stimulate local action that will result in lasting improvements to the state's academic research infrastructure and increased national R&D competitiveness. For example, a project based at the University of Alabama at Tuscaloosa (Award No. 9977661) was a collaborative effort between three universities and Shelton State Community College. This shared effort involved research on the use of electromechanical mechanisms in industry for motion control and other applications, including refrigeration systems for superconducting devices.

Division of Graduate Education (DGE)

Postdoctoral Fellowships in Science, Mathematics, Engineering, and Technology Education (PFSMETE)

The PFSMETE program is aimed at recent Ph.D. graduates in SMET fields and seeks to draw broadly on the diversity of talent available in the U.S. population. The primary objectives of the program are to pre-

pare Ph.D. graduates in SMET fields with the necessary skills to assume leadership roles in science education in the nation's diverse academic institutions, and to provide opportunities for outstanding Ph.D. graduates to develop expertise in a facet of science education research that would qualify them for the new range of academic positions that will come with the 21st century. For example, Anne Arundel Community College in Maryland has employed a postdoctoral fellow who worked on evaluation and assessment issues (Award No. 9714489).

